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Section 1346-11-136

GOOD Pasture For Oklahoma

What GOOD Pasture Can Do
What Research Is Doing for GOOD Pasture

Oklahoma Agricultural Experiment Station
Circular C-125
July, 1947

This publication was prepared to call attention to the need for more GOOD pasture in Oklahoma, and to serve as a guide to the Experiment Station's pasture research. Detailed information on how to grow and use GOOD pasture is available from county agents, vocational agriculture teachers, and others who keep in touch with new developments in research and can apply them to local conditions. A list of Oklahoma publications relating to pasture is available on request.

OKLAHOMA AGRICULTURAL AND MECHANICAL COLLEGE
Agricultural Experiment Station

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GOOD Pasture For Oklahoma

What GOOD Pasture Can Do.

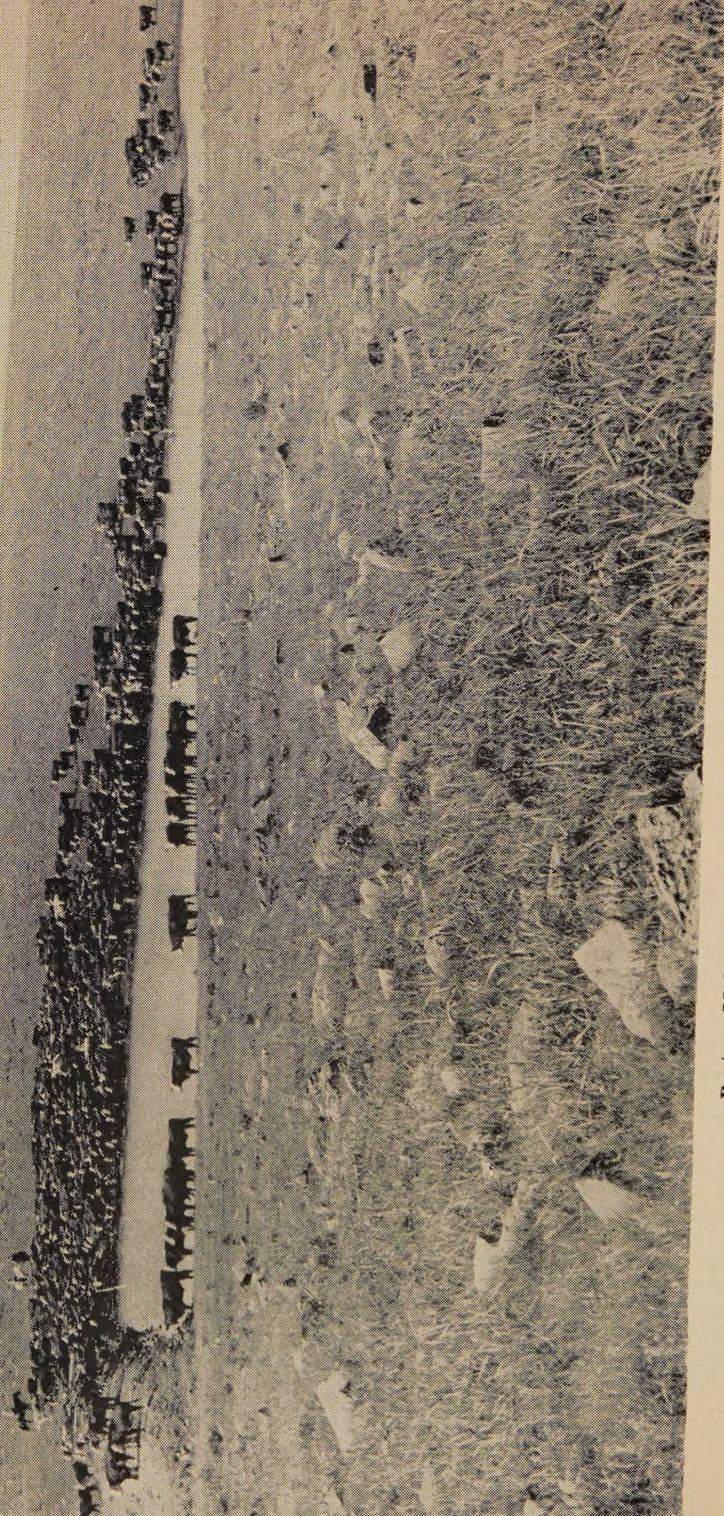
What Research Is Doing for GOOD Pasture.

Oklahoma urgently needs more GOOD pasture. There could be some increase in acreage of pasture, taking the State as a whole,* but *the major opportunity lies in the direction of increased production per acre.* Both the tonnage of forage produced and its nutritive value per pound can be greatly improved.

GOOD pastures are essential in a permanent and economical farm production program for Oklahoma. All classes of livestock, including poultry, need green feed from nutritious pastures. GOOD pasture makes feed which is high in protein, vitamins, and minerals, and makes it at relatively low cost. A farm management system which includes pasture helps tie down the soil to stop erosion. It reduces the amount of soil fertility removed from the farm when crops are sold. It provides income from otherwise unprofitable land, and often could increase the income from better land. It provides income today while conserving soil and maintaining fertility to produce more income tomorrow, and it contributes to the diversification needed to stabilize farm income from year to year.

* See Okla. Agri. Exp. Sta. Bul. B-299, **Looking Forward in Oklahoma Agriculture**, pp. 41 and 44.

THIS PUBLICATION WAS COMPILED in the Experiment Station Editorial Office from information furnished by members of the Station's research staff. Hi W. Staten, in charge of grass and pasture crops research, provided the bulk of the material on pasture establishment and improvement. Robert W. MacVicar of the Agricultural Chemistry Research Staff supplied much of the information on the nutritive value of pasture. Others who contributed were H. M. Briggs, animal husbandman in charge of sheep research; Harley A. Daniel, project supervisor at the Red Plains Conservation Experiment Station, Guthrie (coop. SCS); Horace J. Harper, soils scientist; A. H. Kuhlman, in charge of dairy production research; O. Burr Ross, animal nutritionist; and Rollin H. Thayer, poultry nutritionist.



Pasture Makes Good Use of Land Not Suited for Cultivation.

Land like this which cannot be plowed will produce an income only when pastured. Pasture is also a source of

profit on land which should not be plowed because it is low income land.

Recognizing the importance of GOOD pasture, the Experiment Station in recent years has greatly expanded its pasture research program. Today, 22 research projects related to pasture improvement and the efficient use of pasture are under way (see list, page 30). The projects are integrated to make up a program of broad scope, ranging from soil problems at one end to marketing problems at the other. Work is being done in several parts of the State (see map, page 16). This program has developed to the point where an over-all summary and description seemed needed. Therefore this circular was prepared to emphasize the importance of GOOD pasture in Oklahoma and to serve as a guide to pasture research now being carried on by the Station.

What GOOD Pasture Will Do

GOOD Pasture Makes Concentrated Feed

Green pasture in prime condition of growth on fertile soil is a highly concentrated feed. The protein value of young green grass on a dry basis is equal to about 75 to 80 percent of cottonseed meal. The nutritive ratio of cottonseed meal is around 1:1.2 while the ratio of green pastures is 1:1.3 to 1:2.0. In addition to supplying protein, pasture is high in minerals, carotene, and vitamins. It also seems to have other nutritive values. Little is known at present about these other nutritive elements except that they are needed and apparently are not found in other feeds.

GOOD Pasture Cuts Feeding Costs

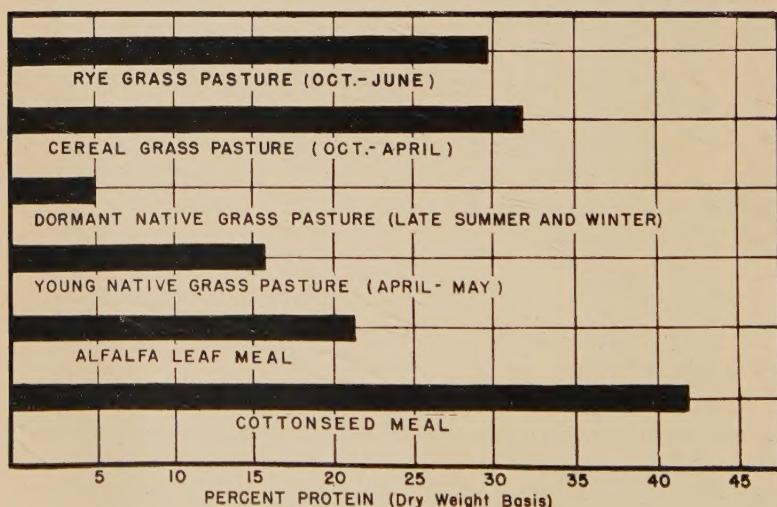
A year-'round pasture program will do much toward reducing feeding costs.

Recent experiments at this Station show that wheat pasture when completely grazed (not saved for grain) will produce 8,000 to 9,000 pounds of green forage per acre. Oats, rye and barley will produce around 12,000 pounds of forage per acre, and ryegrass 16,000 pounds. Chemical analyses showed that each 1,000 pounds of green forage contained as much protein as 150 pounds of cottonseed meal.

Tests elsewhere show that the quantity of protein in a good permanent pasture is about the same as was found for small grains in the Oklahoma tests.

A good bermuda and mixed clover pasture will produce, conservatively, 250 pounds of beef per acre each year. Good native pasture will produce 100 to 150 pounds of beef per acre. Green feed for poultry reduces feed consumption as much as 10 percent for chickens and 25 percent for turkeys. For swine, two acres of alfalfa will provide from 25 to 50 percent of the feed for six sows and their litters. Pasture for dairy cows will produce, roughly speaking, ten times as many pounds of milk as of beef per acre. In other words, a pasture producing 200 pounds of beef per acre would make about 2,000 pounds of milk.

On the basis of net income or total amount of feed nutrients per acre, an acre of GOOD pasture can produce more net profits than an acre planted to cultivated feed crops. Figures collected by the United States Department of Agriculture in 16 states show that for each 100 pounds of digestible nutrients obtained from pasture, the cost was 64 cents. For alfalfa hay it was 83 cents, for corn \$1.38, for corn silage \$1.54, and for



Good Pasture Is a High-protein Feed.

This graph indicates the approximate amount of protein present in young, green native grass as compared with other commonly used feeds and concentrates. During the spring and early summer, there is plenty of high quality protein in these grasses to provide for maximum rates of gain by beef cattle.



Scrub Oak and Gullies Once Occupied This Meadow.

Few farmers use their meadows for landing fields, but the ability of this plane to alight shows how wasteland can be transformed. This lush meadow was covered with scrubby oak and badly gullied a few years ago. Now it is excellent pasture. The scene is at the Red Plains Conservation Experiment Station near Guthrie.

oats \$2.02. (These costs represent average conditions rather than specific examples.) A cost study made in Kansas showed that fertilized tame pasture produced total digestible nutrients at one-half to one-seventh the cost of producing such nutrients from alfalfa, barley, oats or corn.

GOOD Pasture Makes Soil-saving Profitable

In addition to producing immediate income, pasture has an incalculable value in soil conservation and fertility maintenance. Tests over the past 16 years at the Red Plains Conservation Experiment Station near Guthrie* leave no doubt on this point. These tests, and similar ones in other states, show that it takes from 50,000 to 75,000 years to lose 7 inches of top soil from land protected by good grass pasture, whereas it can be lost in from 10 to 50 years when planted annually in row crops.

*Operated jointly by the Oklahoma Station and the research section of the Soil Conservation Service,

The soil-conserving value of pasture is so generally recognized that it needs no further emphasis here. Obviously, however, every acre on every farm cannot be planted to pasture. The balance between pasture and crop land is a problem to be worked out for each individual farm. The important point is that Station research, generally speaking, does show that pasture saves soil and helps maintain soil fertility, that GOOD pasture can be grown almost anywhere in Oklahoma, and that GOOD pasture can be a profitable part of the farm enterprise.

The Nutritive Value of GOOD Pasture

The final proof of the nutritive value of good pasture lies in gains made by cattle and sheep. Mature steers on the Station's Experimental Grazing Area near Stillwater make very good gains on native grass supplemented only with salt. Such steers have gained more than 240 pounds between the latter part of April and early August, and have been sufficiently fat to sell for slaughter. During the early part of the grazing season, when the grass is lush and tender, the gains of steers on grass alone have been equal to the gains made by steers fed limited amounts of corn or cottonseed cake in addition to grass.

Lambs on good wheat pasture have gained about a quarter of a pound a day in Station tests. On abundant wheat pasture, gains have been equal to those in dry lot feeding.

The significant thing about these results is that the animals made the best gains on plants which were young and growing rapidly. Chemical analyses of plants show that this is the stage of growth when the forage is highest in all nutrients: protein, minerals, carotene, and vitamins.

NATIVE GRASSES.

One of the most comprehensive studies ever made of the nutritive value of the pasture plants in a grazing region is now nearing completion at this Station. Chemists for the past six years have followed, month by month, the seasonal changes in nutritional value of almost thirty grasses and shrubs growing near Woodward.* Grass analyses were correlated with

*The grasses analyzed were those found on the U. S. Southern Great Plains Field Station's experimental range area near Supply. The work was a cooperative project of that Station and the Oklahoma Station.

Clover Makes Protein for Stock.

Legumes are a "must" in making GOOD pasture. In eastern Oklahoma a mixture of adapted legumes and bermuda grass will produce up to 250 pounds of beef or 2,500 pounds of milk per acre. Sweet clover and alfalfa are productive legumes elsewhere. Clovers not only provide more protein than grass, but also contain more lime and phosphorus. Winter legumes help give a longer grazing season.



studies of the blood of cattle grazing on the ranges, and the whole interpreted in the light of weight gains made by the cattle.* Similar but less extensive studies have been made of grasses in other parts of the State. From the thousands of separate analyses, certain important facts stand out:

Protein.—Rapidly growing, succulent grass will supply all the protein needed for maximum growth (see graph, page 6). As the pasture becomes dormant, either in dry, hot summer weather or during the winter, the protein content of summer-growing grasses falls. It drops so low during the winter that animals must be fed a protein supplement to maintain their summer gains and make some winter gain.

Cold-weather grasses contain amounts of protein comparable to the warm-weather grasses. At Woodward, the amount of protein supplement needed by cattle during winter grazing was reduced when winter-growing grasses were present on the range.

Minerals.—Calcium and phosphorus are the two mineral elements usually considered as limiting the growth rates of animals in Oklahoma. Young, succulent western Oklahoma grasses contain ample quantities of these two minerals. When the grasses are dry, the phosphorus content may decline to borderline levels; but neither at Woodward nor Stillwater has it gone low enough so fattening steers showed any definite evidence of benefiting from an added supply of phosphorus.

On the acid, low-phosphorus soils common in central and eastern Oklahoma, young grass may not contain enough phosphorus for best animal growth. It is known in a general way that this condition can be corrected by fertilizing the soil and adding legumes to the pasture mixture. But before this general principle can be put into practical application, much more needs to be known about the proper combination of fertilizer and plants for various soils. The needed information is being sought on experimental ranges operated by the Experiment Station at Wilburton, Coalgate, and Stillwater.

*Results are now being prepared for publication in a technical bulletin of the United States Department of Agriculture and in a less technical publication to be issued by the Oklahoma Station.

GOOD Pasture Can Be MADE

This field on the Pasture Fertility Station near Coalgate received two tons of limestone in the spring of 1945. In 1946 it produced 140 pounds of beef per acre. This picture shows the excellent stand of clover in the spring of 1947. Land which was fertilized with lime and phosphate produced four times as much forage alone as unfertilized, and the proportion of weeds was also less on the fertilized land. (Unwanted trees at right were poisoned with white arsenic.)



Carotene.—Vitamin A is the only vitamin likely to be lacking in the rations of sheep and cattle in Oklahoma. These ruminants can synthesize other vitamins within their bodies; but to produce vitamin A their feed must contain carotene, a substance always found in combination with the green coloring matter in plants. Carotene is therefore one of the most important contributions which GOOD pasture makes to the ration of sheep and cattle.

As plants become dormant in either summer or winter, the carotene content falls rapidly. In winter it may be practically absent. Therefore winter-growing plants to provide carotene are important in the pasture program. Range cattle seldom show serious vitamin A deficiency, probably because cool-weather grasses provide small but significant amounts of green forage.

WINTER SMALL GRAINS AND RYEGRASS.

When native grasses are dormant, winter small grains are a readily available source of protein, minerals, and carotene. Station chemists for the past three years have analyzed ryegrass and twenty varieties of wheat, oats, barley and rye clipped each time they reached good grazing height. All were excellent sources of protein, calcium, and phosphorus, and extremely rich sources of carotene.

Carotene.—The carotene in small grain forage is especially valuable because it is available at a time of year when other natural feeds lack this nutrient. It may also become a source of carotene supplement for dry feeds; research on this possibility is now under way.

Protein.—The protein content of the small grain forages was surprisingly high, averaging 30 to 33 percent (dry basis) throughout the grazing season. A considerably larger acreage of small grain pasture might well be planted in Oklahoma to help offset the State's annual deficit of high-protein supplement.

Research now under way aims at finding which nitrogen compounds are included in the protein of small grain pasture. This will show how the protein compares in quality with protein from other sources.

Making GOOD Pasture

The goals in pasture improvement are:

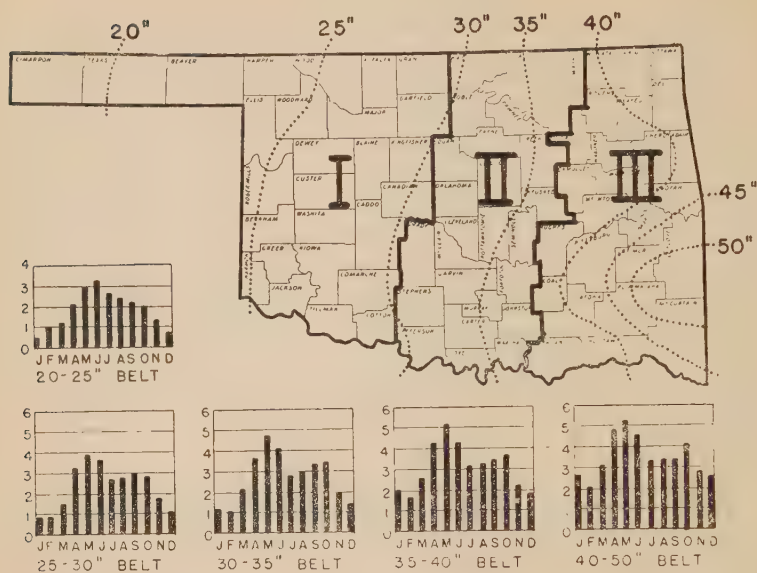
1. Green, rapidly growing plants available for grazing 12 months in every year.
2. Maximum possible yield and quality of livestock feed from each acre of pasture.

At present it is possible to have GOOD pasture for beef and dairy cattle nearly everywhere in Oklahoma from 8 to 10 months each year—about twice as long as when depending on native grasses alone. For hogs and poultry, year-round green feed is already a practical possibility in most parts of the State.

Small Grains Make GOOD Pasture When Other Plants are Dead.

Livestock raisers could well afford to plant winter small grains solely for pasture, without expecting to harvest any grain, Station tests during the past five years show. Small grains at best stage of growth for pasture are high in protein, minerals and carotene (vitamin A).





The Pasture Program Must Fit Rainfall Averages.

In seeking plants for year-round pasture in all parts of Oklahoma, the Station divides the State roughly into the three areas shown above. Each requires a different type of grass and legume combination. The little graphs below the map show there is great variation in the time of year when moisture is most abundant, as well as in total annual rainfall. A major step toward year-round GOOD pasture was the working out of pasture calendars for each of the three sections indicated on the above map. The calendar for central Oklahoma is shown on page 19.

Yield of most Oklahoma pastures can be substantially improved. At present, most pastures in eastern and central Oklahoma can carry without damage only one animal unit to 10 or 12 acres. GOOD native pasture, properly grazed, could carry one animal unit to each five to seven acres. Bermuda and legume mixtures will graze up to one unit per acre. Small grain and rye grass pastures in their prime can support up to two animal units per acre for short periods.

Quality as well as yield of Oklahoma pastures can also be greatly increased. Research has proceeded far enough to show that the acre yield of protein, minerals and carotene can be increased, but many details of practical application remain to be

worked out. Much of the Station's present pasture research is aimed at finding ways of improving nutritive value.

It is not possible to make a year-'round pasture unless two or three or more fields are used. Pastures must be planned so livestock can be rotated in season from one field to another, and the pasture crops must be arranged in sequence so there will be no gaps in the grazing schedule.

In all pasture improvement work, Oklahoma's wide variation in soils, rainfall, and length of growing season must be taken into account. The three areas used by the Experiment Station as a basis for its pasture program are shown in the map on page 14. These areas are, of course, only approximate, and there are many variations within each of the three sections.

Plants for the GOOD Pasture

The first step toward GOOD pasture the year-'round is selection of the crop combinations to be used. A good starting point is a list of the pasture crops adapted to the local soil, rainfall, and length of growing season. From this list can be worked out a succession of crops such that one will come into good grazing condition just as another passes its prime. Temporary or supplemental pastures will be an essential part of the program. It is not possible to have year-'round pasture without them.

Plants which can be used to extend the grazing season in the three pasture-type areas of Oklahoma were listed in the Station's Circular C-116, "Crop Calendars for a Year-'round Pasture Program." The central Oklahoma calendar is shown on page 00. A similar calendar can be made up for a county, a farm community, or an individual farm.

Irrigation may eventually help to extend the pasture possibilities of western Oklahoma. Irrigation of pasture has been extensively tested at the Oklahoma High Plains Station, Goodwell, operated by the Oklahoma Station and the Panhandle A. and M. College. The general results indicate that forage and beef yields can be increased from two to four times, and a year-'round pasture approached, by use of irrigation and proper pasture rotations. Additional research on irrigation of pasture is planned for the new Irrigation Experiment Station near Altus.

PASTURE RESEARCH LOCATIONS EXPERIMENT

STATION RESEARCH PROJECTS ON ALL PHASES
POSSIBLE AT LOCATIONS WHERE SPECIAL

STILLWATER, EXPERIMENTAL RANGE, EXPERIMENTAL GRAZING AREA
Mineral requirements of beef cattle. Handling commercial cow herd on native grass. Wintering and fattening steers on native grass.

BILLINGS, BILLINGS FARM. Mineral, grain and dry roughage supplements for sheep on wheat pasture.

GOODWELL, HIGH PLAINS STATION: Irrigation of pastures.

WOODWARD, U. S. FIELD STATION: Effect of grazing on plant stands and nutritive value. (Coop. U.S.D.A.)

ALTUS, IRRIGATION EXPERIMENT STATION: Irrigation of pastures. Grass seed increase.

GUTHRIE, RED PLAINS STATION: Removing brush from pastures. Re-establishing grass on abandoned and eroded land. Grazing in a crop rotation. (Coop. Soil Conservation research.)

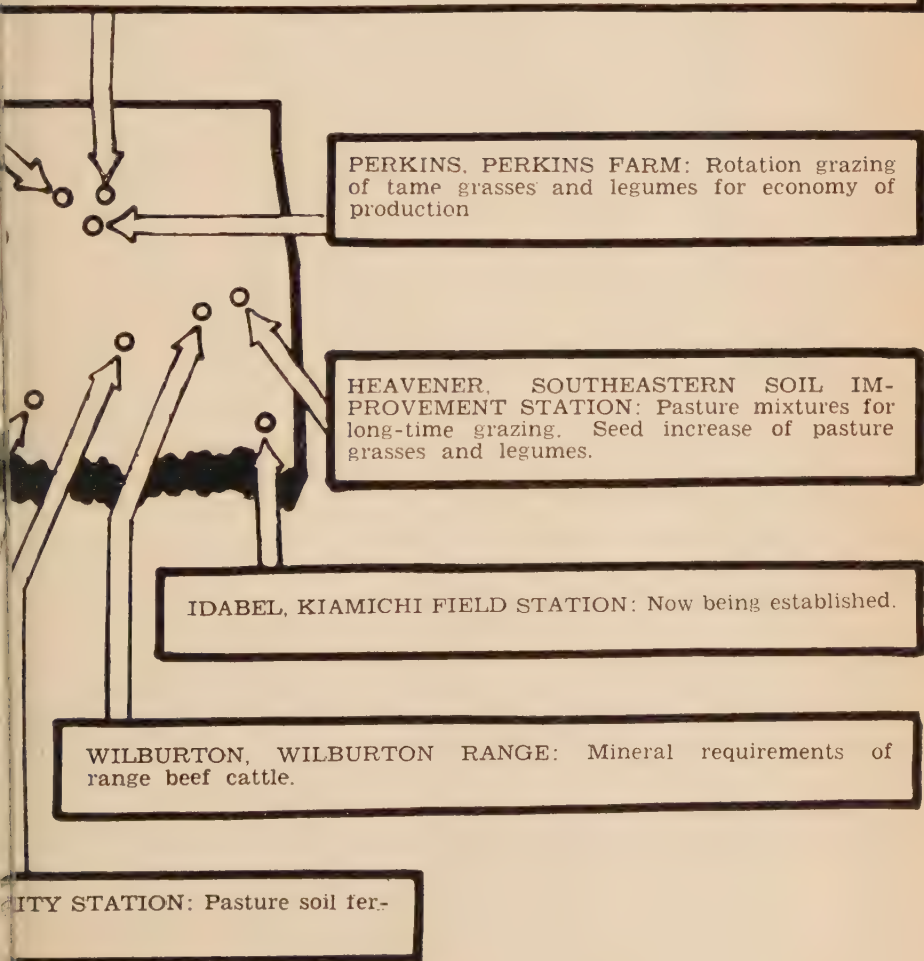
LONE GROVE, SOUTHERN SOIL IMPROVEMENT STATION: Pasture mixtures for long-time grazing. Seed increase of pasture grasses and legumes.

COALGATE, SOUTHEAST PASTURE FE
tility; relation to nutritive value.

IONS OF OKLAHOMA STATION

AGRICULTURE ARE SET UP INsofar AS
OBLEMS OR OPPORTUNITIES EXIST

LLWATER, MAIN STATION Breeding improved grasses and pasture legumes, testing new species Pasture establishment Re-establishing grass on abandoned and eroded land Year-round pasture systems. Green feed for poultry. Effect of soil and climactic conditions on nutritive value of crops. Eradication of pests. Nutritive value of small grain forage Control of insects and plant diseases. Improving pasture silage dehydration haying methods. Economics of pasture use.



WINTER SMALL GRAINS.

An experiment now nearing completion shows that the proper combination of small grains planted for pasture will provide grazing through the fall, winter and spring. Livestock will have a constant supply of highly nutritious feed at relatively low cost. The proper combination of small grains and ryegrass would lengthen the grazing season by 45 days.

It seems probable that small grains could often be planted on livestock farms for their value as pasture alone, without regard for grain yield. They would go far toward offsetting the mineral and vitamin deficiencies now experienced during the winter dormant stage of range grasses, and the high protein would make a valuable saving in protein supplement.

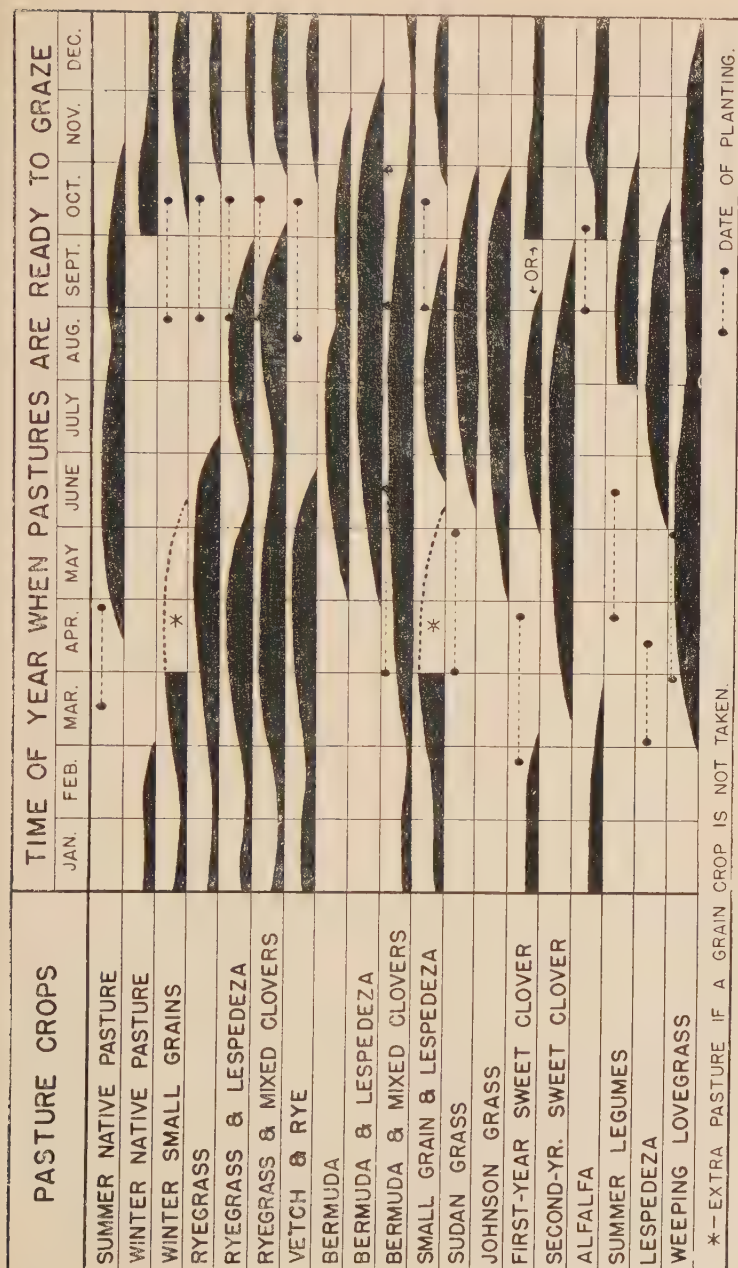
Small grains used solely for pasture would also tend to improve native pastures by preventing too early grazing. Livestock are generally removed from small grain about March 15 to April 1 when a grain crop is to be harvested. Native pastures are injured if grazed through most of April.

NATIVE GRASSES.

Native grasses and bermuda are the basis of any permanent pasture mixture. Research men at this Station and elsewhere have been improving native grasses through selection and breeding. Today there are different varieties of, for example, sideoats grama, just as there are different varieties of corn and cotton. These improved varieties are far ahead of the average run of plants found growing wild. Parents of the improved strains were chosen for high forage yields over a longer period, higher nutritive value, and a habit of growth which makes them easy to graze.

Three improved strains of native grasses already have been turned over to seed growers by the Station. They are Oklahoma No. 1 switch grass and two strains of sideoats grama. Breeding is progressing rapidly with blue grama, buffalo, little bluestem, big bluestem, sand love, bermuda, and other native grasses.

Station plant breeders are now experimenting with the possibilities of producing hybrid grasses similar to hybrid corn,



A Pasture Calendar Like This Can Be Worked Out for Each Farm.

This pasture calendar shows some of the crops which can be used to get GOOD pasture in central Oklahoma a large part of the year. Calendars for western and eastern Oklahoma have also been worked out. The width of each

line indicates the amount of grazing available from the crop listed at the left. The 4-H boys pictured on page 21 are showing how a similar calendar can be made for each farm, or for a community or county.

but major results must await development of additional basic knowledge about the ways inheritance operates in pasture grasses.

IMPORTED AND NEW GRASSES.

Many new grasses from other states and from foreign countries have been tested in recent years in the search for those needed to fill out the year-round pasture program in various parts of the State.

Weeping love grass is already being widely planted, and certified seed originating from the Station's stock is now being produced by growers. Current Station studies on this grass include methods of planting, soil adaptation, time and rate of planting, planting machinery, fertilization, seed production methods, nutritional value, and use for hay, pasture and erosion control.

Smooth brome, alone or with alfalfa, is also finding a place on farms in northeastern Oklahoma where it is adapted. Several hundred selections are now under observation in a search for one that will extend the range of this grass to other parts of the State.

Sweet sudan is being bred for safe pasture use, with promising plants now in the third generation.

Twenty grasses sent from foreign countries by A. and M. graduates in military service are being tested, and two or three show promise of being useful in Oklahoma.

PASTURE LEGUMES.

Legumes are important in the pasture programs in eastern and central Oklahoma farms for two reasons. They provide extra protein and minerals for grazing animals; and, when properly inoculated and fertilized, they help maintain soil fertility and thereby improve growth of grasses. Pasture legumes are being tested by the Experiment Station at many places in Oklahoma (see map, page 16).

Sweet clover should not be overlooked in making the pasture program, because in addition to providing grazing it also is one of the best legumes for increasing the nitrogen and organic matter content of cultivated land. The full benefits of sweet clover have been denied to Oklahoma farms in the past



4-H Boys Help Tell How Station's Research Results Can Provide Year-round Pasture.

because of the need for fertilization, difficulties in getting a stand, and the loss of one year's income from land where it was grown. New methods of planting developed by the Station have pretty well overcome these difficulties.

GOOD Pastures Need Good Soil

The choice of land for pasture will depend on the purpose. If it is to regrass abandoned acres, there is of course no choice. If the purpose is to get a maximum amount of feed as soon as possible, some thought should be given to the possibility of using the best land available. One reason the native pastures of Oklahoma are often low in productivity is that as a general rule they occupy the poorest soil on the farm. Where the land used for pasture is equal to that used for other crops, the net income per acre can be as much or more than from cultivated crops.

Productivity of pastures can often be increased greatly by attention to soil fertility improvement. The use of commercial fertilizers on pasture is in its infancy in Oklahoma. It is important to know how much to use, what kind to use, and when and how to apply it. A comprehensive study of these questions is being made at the new Southeastern Pasture Fertility Station near Coalgate. The first year's results show a 65 percent increase in beef production per acre as the result of applying lime and phosphate. This figure is conservative.

In general, it is safe to say that lime, phosphate, and nitrogen fertilizers will increase both the yield and quality of forage on land which needs them. The question of cost versus return is now being studied in work underway at Coalgate and elsewhere.

Lime and phosphorus are especially important for the growth of legumes. Legume forages are high in both calcium and phosphorus. This is one reason they add so much to the nutritive value of a pasture. But it also means they take minerals from the soil at a rapid rate. Where legumes are grown, soil acidity increases and phosphate content decreases much faster than where grass is grown alone. Therefore limestone and phosphate fertilizer must be applied to keep the soil in condition for growing legumes. The legumes then provide nitrogen for a better growth of grass.

Planting New Pasture

Oklahoma needs 360,000 to 500,000 pounds of grass and pasture legume seed each year, and the supply is far below that figure. This means three things: (1) There is opportunity to profit by growing seed for sale, at least until supply meets demand; (2) caution must be used in buying seed, to get good quality; and (3) plantings must be carefully made to avoid loss of expensive seed. It is along these three lines that the Station's present research on seed sources and seed production is directed.

Experimental results at Stillwater and Guthrie show conclusively that seed yield of grasses and pasture legumes can be increased by planting them in rows, cultivating them like a field crop, and applying commercial fertilizer where needed. Nitrogen fertilizers applied in early spring have increased seed yield of weeping love grass four to five times as compared to unfertilized plots.

Tests in which a hammermill was used to dehull native grass seed indicate this treatment holds promise to better germination, more accurate seed analysis, and easier, more uniform planting.



Minerals Make Legumes to Make Protein.

The sod on the left is from acid, low phosphate soil on the Southeast Pasture Fertility Station near Coalgate. The sod on the right is from the same soil treated with lime and phosphate. Both fields were seeded at the same time with the same clover mixture. GOOD pastures grow only on good soils.

Native grass seed grown in Oklahoma, or in states to the east or west, is much more satisfactory than seed from states further north, results in Station nursery plots show. Analysis of seed purchased by the Station also indicates that much poor quality seed is now being distributed because of the present great demand.

Tests of grass seeding methods show that in the dry sections of the State a sorghum stubble mulch must be provided before seeding. In sections where the rainfall is above 30 inches, however, the stubble mulch has been detrimental. In those sections, a good seedbed and properly fertilized soil are needed. The Station has developed grass seed drills which aid in getting this job done. Several experiments are now in progress to find the best methods for preparing seedbeds, time of seeding, and depth and rate of seeding.

Good stands of native grasses have been obtained at the Red Plains Station and on the Lake Carl Blackwell Area by the seed-hay method. Mature grass bearing seed is cut in the fall and spread on the land to be planted. This method is useful for starting native grass on small areas and for seeding gully banks after treatment (See Bulletin B-309).

Regrassing Abandoned Land

The no. 1 question in pasture production in Oklahoma today is how to regrass the State's 2½ million acres of abandoned cultivated land. The major problem in regrassing this worn-out land is to provide enough initial fertility to get the grass started. Fertilization at the usual rates is frequently too costly. To meet this situation, the Station has worked out a system of establishing sweet clover with a minimum of phosphate and lime. This is effective where subsoils are not too acid or low in phosphate. The sweet clover, once established, will provide the nitrogen and organic matter needed to give good grasses a start.

The plan of using sweet clover to provide nitrogen is one element in highly successful methods of starting native grasses on gullied fields which have been worked out at the Red Plains Conservation Experiment Station near Guthrie.



These Sleek Angus Are Grazing Abandoned Farm Land.

The Livestock Grass and Pasture Field Day visitors pictured here are seeing part of the Oklahoma A. and M. College purebred beef herd on pasture that two years before the picture was taken was covered with poverty grass and weeds. The area is part of the Oklahoma Stations 4,500-acre experimental grazing tract near Still-

water. This land had been abandoned from cultivation at least ten years. It was low in lime, phosphate, and organic matter. Newly developed seeding methods are putting it back to use and at the same time protecting the soil from further deterioration.

Regrassing of low income land is being studied on abandoned cultivated fields on the Lake Carl Blackwell area. The land had lost all its topsoil and was low in lime, phosphorus, and organic matter. One 40-acre area is used to test various combinations of fertilization, seedbed preparation, mixtures of species, and time of seeding. This test has proceeded far enough to show that the first step is cultivation to get rid of poverty weeds and grasses. Other questions about best procedure in returning abandoned land to grass will be answered as the test proceeds.

Improving Native Pasture

Most existing native pastures could be made more productive by removing light brush, mowing to control weeds, and resting to allow grass to recover from the effects of over-grazing.

Work at the Red Plains Station shows that grass yield can be greatly increased by removing the scrubby trees or brush from Oklahoma's approximately five million acres of such land, but cost records indicate that clearing is economically profitable only on land with light brush and scattered trees. Current research is aimed at finding more economical methods of clearing. New chemical plant poisons are being tested, and brush clearing machinery is being designed and tested.

The most effective time to mow weeds is when the plants are about ready to bloom, a recently completed three-year test shows.

Methods of eradicating poisonous plants from native pastures are suggested in Circular C-118.

Over-grazing, especially in early spring and at the time the grass should be making seed, has been a potent cause of deterioration on Oklahoma native grass pastures. Unfortunately, the long-time cost of over-grazing is harder to calculate than the immediate profit. Station economists, analyzing beef yields on over-grazed and moderately grazed pastures,* found that the economic advantage lies on the side of over-grazing if the long-time effect on the grass is not taken into account.

*The data used were those obtained on the U. S. Southern Great Plains Field Station's experimental range near Supply.

A basis for scientific evaluation of stocking rates is now being sought by the Station in chemical analyses of the nutritive value and root reserves of over-grazed pastures as compared to those moderately grazed.

The practice of deliberately burning pasture is rapidly being abandoned. Tests at the Red Plains Station show that burning destroys plant nutrients, increases soil and water losses, and decreases hay yields. Oklahoma Station tests show burning reduces annual grass yield 40 to 50 percent. The only excuse for burning is to make early spring grass more available to animals, and this can be done by mowing and proper grazing. It is unlikely that burning helps control insects.



The Mower Is a Useful Pasture Tool.

In machinery tests at the Red Plains Station near Guthrie, specially equipped mowers have proved valuable for cutting small brush and keeping down second growth. Work at Red Plains is in cooperation with the Soil Conservation Service. Oklahoma Station tests elsewhere have shown the value of mowing weedy pastures to allow grass to come back; and Station chemists, by analyzing root reserves of sage brush, helped find the right time for mowing sage brush at the federal experiment station near Woodward.

Using GOOD Pasture

Effort spent on making GOOD pasture is wasted unless the pasture is fitted into a profitable farm management plan. Therefore Station research with pasture includes studies of how it can be used most profitably.

Much of the Station's beef cattle research in recent years has related to the use of pasture for wintering and maintaining cattle and for finishing them for market. Since 1941, this work has been carried on at the 4,500-acre experimental range on the Lake Carl Blackwell area near Stillwater. The unit includes both native grassland and regrassed areas. It is arranged so that experimental accuracy can be maintained while using pastures big enough so results will be directly applicable on farms and ranches. Recent work involves winter feeding of hay vs. year-long grazing in maintaining the commercial cow herd, wintering steers on grass, and fattening on grass. Results are reported annually at Livestock Feeders' Day and Livestock Grass and Pasture Field Day.

Methods of handling lambs on wheat pasture, including tests of various supplements, are being extensively tested on a 175-acre tract near Billings. Plans for future research include methods of finishing lambs in dry lot after they are removed from wheat pasture.

Use of green feed for poultry, based on Station research and on experience with the College flocks, is discussed in Station Circular C-120 and Mimeographed Circular M-134. Feeding tests are now under way to determine whether green feed can be satisfactorily substituted for a major part of the mash and grain ration now generally used by poultrymen. A study of production of poultry green feed under irrigation in western Oklahoma is included in plans for future research.

GOOD Pasture for Bad Weather

Pasture for every month in the year is a feasible goal in Oklahoma, but a truly year-'round pasture program will not do the entire job of feeding. Weather conditions often injure grasses or temporarily interrupt grazing. At such times, pasture stored in the form of silage or properly cured hay is needed. Dehydrated pasture may be a practical possibility in the not too distant future.

Native grass hay is good feed if cut in prime condition of growth. Station tests show that Oklahoma prairie hay *cut at the right time and properly cured* supplies all the carotene needed by dairy cows. These tests also show that prairie hay contains enough protein to be worth considering. A current test aims at finding the time of cutting which gives the most desirable combination of yield and nutritive value. Another test is indicating that when protein meals cannot be secured a passable ration can be made by using a minimum amount of ground alfalfa hay in combination with good native grass hay.

Native grass hay is sometimes low in minerals, but phosphate fertilization has increased the phosphorus content significantly in some seasons. The increase was often enough to change the forage from a deficiency to a point high enough to meet animal requirements.

Silage, which is actually stored pasture, has been a foundation store of dairy feeding for decades. Early Oklahoma research showed the value of sorghum silage where corn cannot be grown, and also proved the high value of sorghum silage in beef production.

The value of sweet clover for silage is now being tested. In 1946, highly palatable silage was made without adding preservatives. An acre of average Oklahoma sweet clover will yield from 500 to 800 pounds of protein, by chemical analysis. This is equal to one and a quarter to two tons of high-protein meal.

Various phases of growing alfalfa for dehydration are being studied in cooperation with the Kansas and Nebraska stations. The Oklahoma Station's part is to determine the actual effects of early cutting on yield, hay quality, and life of plants.

The high protein and carotene content of small grain forage shown in Station tests indicates that this material could be dehydrated and prove a highly valuable supplement for animals on dry feed.

PASTURE RESEARCH PROJECTS**of the****Oklahoma Agricultural Experiment Station**

Research projects relating to pasture production, improvement and use **now under way** at the Oklahoma Agricultural Experiment Station include:

Pasture and Soil Fertility.

Soil fertility and pasture improvement. A comprehensive test of the effect of various fertilizers, including legumes, on the forage yield of pastures and on the nutritive value of pasture plants and mixtures as shown by chemical analyses and by weight gains of cattle.

The establishment and maintenance of plant cover and its effects on erosion under Oklahoma conditions. (Coop. SCS Research at Red Plains Station.)

The use of grass and other vegetative cover for controlling gullies and reducing erosion on eroded subsoil. (Coop. SCS Research at Red Plains Station.)

Effect of soil and climatic conditions on the chemical composition of legume crops.

The potassium content of plants in relation to potassium in the soil.

Pasture Plants and Pasture Planting.

Breeding of perennial native and exotic grasses. Native grasses selected from natural stands are being selected to improve their yield, nutritive qualities, and adaptation to grazing; and new grasses showing promise for use in Oklahoma are being selected for adaptation.

Propagation of perennial native and exotic grasses. Methods of establishing grasses, particularly on eroded or abandoned land, are being tested.

Pasture and meadow development and management on eroded and brushy land. (Coop. SCS Research at Red Plains Station.)

Pasture legumes. Testing varieties and strains for adaptation and possible use in Oklahoma, developing new strains especially for Oklahoma, and determining proper time and method of planting for use in pasture mixtures.

Determining isolation needed for production of pure seed of grasses, for growing certified seed. (Especially for corn, but results probably will be adapted to use with other members of grass family.)

Improving Native Pasture.

Testing and development of machinery for removing woody vegetation and establishing, maintaining and improving permanent pastures. (Coop. SCS Research at Red Plains Station.)

Eradication of weeds, especially by mowing and by use of newly developed chemical compounds.

Use and Nutritive Value of Pasture.

Determination of mineral supplement requirements of range beef cattle.

Chemical analysis of the nutritive value of green and dehydrated small grain forage clipped at best grazing height.

Grazing as part of a four-year crop rotation of oats, sweet clover, vetch, cotton, and darso. (Coop. SCS Research at Red Plains Station.)

Chemical analysis of small grain forage to determine nitrogen components of the protein.

Effect of over-grazing and moderate grazing on food storage in roots and foliage of range grasses at Woodward.

Chemical and vitamin content of grasses and pasture shrubs on experimental range of Woodward experiment station. (Completed; publications now being prepared.)

Development of methods of using green feed to provide the largest possible portion of the ration for poultry.

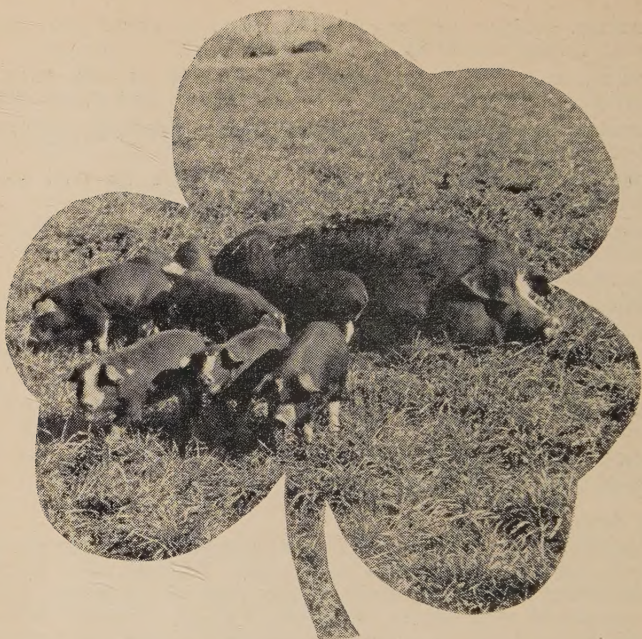
Comparative value of various mineral, concentrate, and dry roughage supplements for lambs fattening on wheat pasture.

Methods of utilizing bluestem grass in maintaining the commercial cow herd.

Methods of making maximum use of grass and minimum use of grain in producing finished yearling steers.

Related Research.

A number of projects not directly concerned with pasture are developing information having pasture application. Pasture value of plants is given consideration in small grain variety tests and breeding, and in the project concerned with testing new types of crops. Projects on control of plant diseases and insects often produce results useful in pasture work. Other projects deal with "stored pasture"; these include studies of the best date of cutting prairie hay, sweet clover for silage, and the effect on alfalfa stands of early cutting for dehydration.



**GOOD Pasture Provides Minerals, Vita-
mins and Protein for All Types of
Livestock and Poultry**